Western Region Technical Attachment
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BLOCKING: HOW WELL DO THE MODELS FORECAST IT?

This Technical Attachment addresses the question of how well operational numerical models forecast the various stages of blocking. It is a synopsis of a paper by Tibaldi and Molteni (hereafter TM) entitled "On the operational predictability of blocking" which appeared in *Tellus*.

In their study, TM examined the ECMWF operational and forecast data to determine the model's skill in predicting: 1) the onset of blocking, 2) the location and amplitude of blocking, and 3) the maintenance of blocking once it has appeared. They looked at seven 100-day winter periods for the seasons 1980-81 through 1986-87 using data at the 500-mb level. Their findings may be summarized as follows:

1. Serious systematic deficiencies were found in model forecasts of blocking beyond days 3 to 4. By day 10, the model forecasts blocking only 50 percent as often as it is observed, and of these forecasts of blocking, only 50 percent of them verified correctly. In other words, the model forecast blocking correctly on day 10 only 25 percent of the time.

2. The forecast of the onset of blocking is almost consistently missed beyond forecast days 3 to 4. The model skill in the first few days is relatively high, but degrades rapidly with time. On the other hand, once blocking appears in the initial conditions, duration is predicted reasonably well with a slight tendency to break down the block too soon.

3. The predominant areas for blocking over the northern hemisphere were found to be in the east Pacific and near the European/east Atlantic region in accord with previous observational studies. The model tended to handle these two areas differently. The Pacific blocks tended to be forecast too far west with time, while the Euro/Atlantic blocks tended to be forecast too far east time, e.g., days 1 to 4 forecasts of blocking had little systematic error in location, but after day 4 the blocks were forecast too far west in the Pacific and vice versa for the Atlantic. Over the seven years studied, the model showed some improvement in the handling of Atlantic blocking, but not in Pacific blocking. This last result combined with the different error in location suggests that different physical mechanisms are important to blocking in these two areas.

4. Although the ECMWF model went through considerable change during the seven year period of study, e.g., change from grid point to spectral, increased resolution, improved physics, etc., there was very little improvement in forecast skill related to blocking. In general, the model tends to a more zonal regime with time, and this forecast of zonal conditions occurs much more frequently in the model than in the real atmosphere.

This study confirms the suspicions of many synopticians that the model does a much better job of maintaining blocking than it does of predicting the onset of blocking. The study only examined the ECMWF output, but it is likely that the MRF suffers a similar problem at least with respect to prediction of onset and maintenance. It is not known if the MRF has similar biases towards location and amplitude of blocks as the ECMWF

Reference

Tibaldi, S., and F. Molteni, 1990: On the operational predictability of blocking. *Tellus*, 42A, 343-365.